DOCUMENT RESUME

ED 111 869 TM 004 837

AUTHOR	Reaser, Joel M.; And Others
TITLE	A Test of the Forced-Alternative Random Response Questionnaire Technique. Technical Report No. 75-9.
INSTITUTION	Human Resources Research Organization, Alexandria, Va.
SPONS AGENCY	Army Research Inst. for the Behavioral and Social Sciences, Arlington, Va.
REPORT NO	HumRRO-TR-75-9
PUB DATE	Jun 75
NOTE	44p.
EDRS PRICE	MF-$0.76 HC-$1.95 Plus Postage
DESCRIPTORS	Confidentiality; Data Collection; Item Analysis; Measurement Techniques; *Military Personnel; Probability; *Questioning Techniques; *Questionnaires; Response Mode; *Response Style (Tests); Social Problems; *Surveys
IDENTIFIERS	*Forced Alternative Random Response Technique; Mail Surveys

ABSTRACT

This study tested a variation of the random response surveying strategy designed for lengthy questionnaires to be used in group administrations or mail surveys. A questionnaire was mailed to a random sample of 3,000 company grade officers divided into three groups. One group received a conventional questionnaire. The second group received a random response questionnaire (FARR-50 technique) using a 50 percent likelihood of having to respond honestly. The last group received a random response questionnaire (FARR-83 technique) using a 83.3 percent likelihood of having to respond honestly. It was found that subjects respond more honestly, i.e., with greater estimated incidence of true positive response, to sensitive questions when given a low level of protection provided by the FARR-83 technique. Rates of response and estimate levels of prevalence were higher when subjects were given some protection than when they were forced to answer the questions honestly more frequently--even though the latter afforded greater protection. (Author)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

Technical Report 75-9

HumRRO TR-75-9

HumRRO

A Test of the Forced-Alternative Random Response Questionnaire Technique

Joel M. Reaser, Steven Hartsock, and Arthur J. Hoehn

ED110069

U.S. DEPARTMENT OF HEALTH EDUCATION & WELFARE NATIONAL INSTITUTE OF EDUCATION

HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street • Alexandria, Virginia 22314

TM004 837

Approved for public release; distribution unlimited.

June 1975

Prepared for

U.S. Army Research Institute for the Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, Virginia 22209

2

The Human Resources Research Organization (HumRRO) is a nonprofit corporation established in 1969 to conduct research in the field of training and education. It is a continuation of The George Washington University Human Resources Research Office. HumRRO's general purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development, and consultation. HumRRO's mission in work performed under Contract DAHC19-73-C-0004 with the Department of the Army is to conduct research in the fields of training, motivation, and leadership.

The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

Published
June 1975
by
HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street
Alexandria, Virginia 22314

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER HumRRO-TR-75-9	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) A TEST OF THE FORCED-ALTERNATIVE RANDOM RESPONSE QUESTIONNAIRE TECHNIQUE		5. TYPE OF REPORT & PERIOD COVERED Technical Report 6. PERFORMING ORG. REPORT NUMBER Technical Report 75-9
7. AUTHOR(S) Joel M. Reaser, Steven Hartsock, and Arthur J. Hoehn		8. CONTRACT OR GRANT NUMBER(S) DAHC19-73-C-0004
9. PERFORMING ORGANIZATION NAME AND ADDRESS Human Resources Research Organization (HumRRO) 300 North Washington Street Alexandria, Virginia 22314		10. PROGRAM ELEMENT PROJECT TASK AREA & WORK UNIT NUMBERS 62108A; 2Q162108A740; 00; 009
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Research Institute for the Behavioral and Social Sciences 1300 Wilson Boulevard, Arlington, Virginia 22209		12. REPORT DATE June 1975 13. NUMBER OF PAGES 41
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Research performed by HumRRO Eastern Division, Alexandria, Virginia, under Work Unit MODE.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Attitudes
Drug use
Job satisfaction
Mail surveys
Measurement
Questionnaires
Race relations
Random response surveys
Surveys

0502

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This study tested a variation of the random response surveying strategy designed for lengthy questionnaires to be used in group administrations or mail surveys. A questionnaire was mailed to a random sample of 3000 company grade officers divided into three groups. One group received a conventional questionnaire. The second group received a random response questionnaire (FARR-50 technique) using a 50% likelihood of having to

(Continued)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. (Continued)

respond honestly. The last group received a random response questionnaire (FARR-83 technique) using a 83.3% likelihood of having to respond honestly. It was found that subjects respond more honestly, i.e. with greater estimated incidence of true positive response, to sensitive questions when given a low level of protection provided by the FARR-83 technique. Rates of response and estimated levels of prevalence were higher when subjects were given some protection than when they were forced to answer the questions honestly more frequently--even though the latter afforded greater protection.

SUMMARY AND CONCLUSIONS

MILITARY PROBLEM

Many individuals are reluctant to give candid answers to survey questions on socially sensitive problems such as drug abuse, racial prejudice, and dissatisfaction with the Army. Cost-effective and efficient methods of conducting surveys on such topics are needed to assess the magnitude of social problems. Development of methods for collecting information on critical social concerns or issues is the general problem to which this and several previous studies under Work Unit MODE are directed.

RESEARCH PROBLEM

This research was directed at testing a variation of the random response techniques. This variation, the Forced-Alternative Random Response (FARR) technique is one of a number of random response approaches for assuring respondent anonymity in responding to sensitive questions. This particular variation was developed for mass administration and mail surveys making use of extensive questionnaires. Such surveys are a primary technique for gathering attitudinal and experiential data from personnel in large organizations such as the Army.

The primary research question of this study concerned the viability of the FARR procedure: Could this procedure with its somewhat complex instructions be successfully employed in a mail survey addressing a variety of socially sensitive topics?

The research question was tested on the basis of response rates, comments offered by respondents, and rates of prevalence estimated from the FARR technique compared to straightforward (non-random response) questionnaires.

An ancillary research question dealt with whether the subject's willingness to be honest was dependent on the degree of protection offered by the procedure: Does the subject's willingness to admit a stigmatizing, or less popular attitude increase with a decrease in the likelihood of his having to respond honestly?

The FARR technique involves:

(1) Use of a questionnaire of dichotomous or multiple-choice items. (In this test, dichotomous items were used, all of which had the same response as the stigmatizing response.)

(2) Use of a randomizing device to let the subject randomly select whether to answer an item honestly or to indicate the Forced-Alternative response, i.e., a response which may or may not be related to reality.

The procedure is as follows:

(1) Read a question

(2) Operate the randomizing device[1]

Depending on the results of the randomizing, the subject either:

(1) Answers honestly, or

(2) Answers with the stigmatizing or less socially acceptable response.

The FARR technique has several advantages over conventional questionnaires and other random response (RR) approaches. Like other RR techniques, it provides the

[1] A number of devices have been used for randomizing (e.g., spinners, colored marbles in a box, demographic categories with known statistical distributions). For use as part of FARR, a Random Number Target (RNT) was designed and tested. The RNT is described in the body of the report.

subject with assurance that he can respond to any question knowing that no one, including the researcher, is able to identify his true response. The advantages of the FARR variation are: (a) Once the subject is given instructions on the procedure, it is quickly administered; (b) the variance of the estimates of prevalence is minimized; and (c) it can be used for lengthy questionnaires. Moreover, the procedure can be applied to any currently existing questionnaire designed within several simple parameters.

APPROACH

For this test of the FARR technique, a sample of 3000 company grade officers was randomly selected from active Army files. This sample was evenly divided among first and second lieutenants and captains. One week in advance of the questionnaire, subjects received a postcard which solicited their cooperation in participating in the survey.

The sample was randomly split into groups of 600, 900, and 1500. The smallest group received a conventional (not random response) questionnaire. All the items were exactly the same as those on the FARR questionnaire. The second and third groups received the same questionnaire but with instructions to use the FARR procedure. The only difference between the questionnaires received by those two groups was the probability that the subject would be required to respond with the forced alternative rather than his true response.

One version was arranged so that the subject had only a 50% chance of having to answer the question honestly (FARR-50). The other version was set up with the probability that the subject would have to answer honestly five times out of six (FARR-83).

It was hypothesized that the less frequently the subject was required to answer honestly, the safer he would feel and the more honest he would be in responding.

RESULTS

The conventional questionnaire method provided the highest return rate—3 to 5% higher than either of the FARR questionnaires. However, those responding to the FARR-83 indicated a higher incidence of drug use, racism, and Army discontent than did the conventional questionnaire. The FARR-50 estimates of the incidence of these sensitive areas was significantly lower than that of either the conventional questionnaire or FARR-83.

CONCLUSIONS

It can be concluded from the results that the FARR-50, although offering more protection, is also intimidating. The subject was forced to answer "Yes" to 50% of the questions. This apparently produced anxiety in the individual because he felt that his opinion would be misrepresented by the questionnaire. Consequently, many FARR-50 subjects apparently answered all questions honestly instead of following the FARR

procedure. The FARR-83 technique, which provided less security than the FARR-50, allowed the individual to feel both secure and adequately represented.

Some further investigation is needed to determine: (a) the most appropriate levels of probability for responding honestly, and (b) the technique's utility for broader populations. The FARR technique was shown to be a viable technique of eliciting socially sensitive or stigmatizing information.

PREFACE

This document is a report prepared by the Human Resources Research Organization (HumRRO) presenting the results of a test of the Forced-Alternative Random Response questionnaire technique. The technique is one of a number of such survey techniques that have been designed to protect the subject who is requested to respond to questions dealing with socially unaccepted or illicit behaviors or attitudes.

The study reported in this document is one in the series conducted as a part of Work Unit MODE, which is directed at research into methods of data acquisition in social problem areas. The research was conducted by HumRRO Division No. 7 (now a part of HumRRO Eastern Division). Dr. Robert G. Smith was Director of the Division during the conduct of the research; Dr. J. Daniel Lyons is the present Division Director.

Dr. Joel M. Reaser conceptualized the project and supervised implementation of the plan and the writing of this report; Dr. Arthur J. Hoehn developed the research plan. They were assisted substantially by Mr. Steven Hartsock.

Appreciation is expressed to the officers who participated in the study.

HumRRO research for the Department of the Army under Work Unit MODE was conducted under Contract DAHC19-73-C-0004. Army training research is performed under Army Project 2Q162108A740. The work was conducted under the sponsorship of the U.S. Army Research Institute for the Behavioral and Social Sciences, with Dr. Douglas Ramsay serving as the technical monitor.

Meredith P. Crawford
President
Human Resources Research Organization

CONTENTS

	Page
Summary and Conclusions	1
Preface	5
Introduction	11
Background	12
The Random Response Technique	12
The Forced-Alternative Random Response (FARR) Model	13
The Estimation Procedure	13
Background of the Current Study	15
Purpose of the Current Study	16
Methodology	17
Procedure	17
The Questionnaire	17
Alternative Randomizing Devices	18
Advance Notice Cards	19
Results	20
Conclusions	24
Bibliography	27
Appendices	
A Background Paper, "A Forced-Alternative Random Inquiry Procedure for Group or Self Administration"	29
B Survey Materials	34
C Demographics of the Sample	42

List of Illustrations

Figure		
1	Random Number Target	19
2	List of Items Used on all Questionnaire Types	22
A-1	Sample Questions Illustrating Differences in Random Inquiry/Random Response Models	31

List of Tables

Table		
1	Rates of Response, by Questionnaire Type	20
2	Estimates of Incidence for Each Questionnaire Item	21

List of Tables *(Continued)*

Table		Page
3	Results of the Mann-Whitney U-Test of Significance	23
4	Comparison of Estimates From the FARR-50 and FARR-83 Questionnaires	23
C-1	Return Sample Distribution, by Educational Level	42
C-2	Return Sample Distribution, by Age at Last Birthday	42
C-3	Return Sample Distribution, by Racial Group	43
C-4	Return Sample Distribution, by Pay Grade	43
C-5	Breakdown of Those Who Received Advance Notice Cards	44

A Test of the Forced-Alternative Random Response Questionnaire Technique

INTRODUCTION

Many personnel are reluctant to give candid answers to survey questions on socially sensitive problems such as drug abuse, racial prejudice, and dissatisfaction with the Army. Economical and efficient methods of conducting surveys on such topics are needed to assess the magnitude of social problems. Development of such methods for collecting information on critical social concerns or issues is the general problem to which this and several previous studies under Work Unit MODE are directed.

The purpose of this study was to test the viability of a variation of the random response technique. Random response techniques use a device to randomize questions, or answers to questions, to provide anonymity and a sense of security to subjects responding to stigmatizing or threatening questions. The variation tested in this study is known as the Forced-Alternative Random Response (FARR) technique. This particular approach was developed for mass administration and mail surveys making use of extensive questionnaires. Such surveys are a primary technique for gathering data in large organizations such as the Army. The FARR technique is potentially a cost-effective, efficient means for collecting sensitive data.[1]

[1] Presented in a working paper prepared by Joel M. Reaser, "A Forced-Alternative Random Inquiry Procedure for Group or Self Administration," May 1973. During the course of this study, the paper was used to provide background information to respondents who are interested in the research methodology being tested. The paper is reproduced as Appendix A.

BACKGROUND

Obtaining the cooperation of respondents when soliciting information on knowledge of, or experience with, socially sensitive attitudes or behaviors is a crucial problem in research on social issues. Individuals are reluctant to express their true feelings concerning many socially sensitive issues, particularly if their attitudes or experiences might be illegal or if there is any danger of their being identified. Regardless of guarantees of confidentiality or anonymity, subjects feel threatened when responding to such questions. Yet it is essential that information on incidence and prevalence of sensitive and/or illicit activities and related attitudes be gathered.

THE RANDOM RESPONSE TECHNIQUE

Warner[1] devised an ingenious procedure for overcoming this problem. The Random Response (or Random Inquiry—*RI*) technique[2] is a uniquely appropriate procedure for eliciting cooperation from subjects asked to respond to questions on sensitive issues such as drug use, race, abortion, and dissatisfaction with one's superiors or organization. This method for collecting sensitive information provides the subject and the researcher with a guaranteed anonymity.

Warner's original strategy was to enable the subject to answer one of two questions. For example:

Question A: *I use heroin.*

Question B: *I do not use heroin.*

The subject, using some randomizing device (e.g. die toss, coin flip), draws one of the two questions and simply answers "True" or "False" without telling the experimenter which question he is responding to. By knowing the probabilities associated with drawing either question, the researcher can accurately estimate the number of those who actually use heroin, yet the identity of the individuals who indicated they use heroin remains unknown.

This approach has attracted a number of researchers interested in applying or refining the technique. Extensions have been made by Abul-Ela, Greenberg, and Horvitz,[3] Horvitz, Shak, and Simmons,[4] Brown and Harding,[5] Greenberg *et al.*[6]; and Simmons[7] in attempts to find maximally efficient alternatives to the original Warner technique.

[1] S.L. Warner. "Randomized Responses: A Survey Technique for Eliminating Evasive Answer Bias," *Journal of the American Statistical Association*, vol. 60, 1965, pp. 63-69.

[2] Random Inquiry is a variation of the Random Response (RR) technique which randomizes the question asked (i.e., random inquiry) rather than the honesty of the response given.

[3] A.A. Abul-Ela, B.G. Greenberg, and D.G. Horvitz. "A Multi-proportions Randomized Response Model," *Journal of the American Statistical Association*, September 1967, pp. 990-1008.

[4] D.G. Horvitz, B.V. Shak, and W.R. Simmons. "The Unrelated Question Randomized Response Model, *Proceedings of the Social Statistics Section of the American Statistical Association*, 1967, pp. 65-70.

[5] G.H. Brown and F.D. Harding. "A Comparison of Methods of Studying Illicit Drug Usage," HumRRO Technical Report 73-9, April 1973.

[6] B.G. Greenberg, A.A Abul-Ela, W.R. Simmons, and D.G. Horvitz. "The Unrelated Question Randomized Response Model: Theoretical Framework," *Journal of American Statistical Association*, vol. 64, 1969, pp. 520-539.

[7] W.R. Simmons. "Response to Randomized Inquiries: A Technique for Reducing Bias," *Administrative Applications Division Conference Transactions, American Society for Quality Control*, March 1970, vol. 1, no. 10, pp. 4-13.

Horvitz *et al.*, used a variation wherein Question B was totally innocuous and unrelated to Question A, which was a sensitive question. A known number of people will respond "Yes" to Question B. For example:

Question A: *Did you induce an abortion last year?*

Question B: *Were you born in North Carolina?*

These authors point out two advantages to the use of an innocuous second question:

(1) The subject realizes that there is a good likelihood of his answer being related to an entirely non-threatening question.

(2) The variance of the estimate of the percentage of those with the stigmatizing characteristic is smaller than in the Warner technique.

Moors[1] points out that the variance can be further reduced if the answer to the second question is always known. For example:

Question A: *Did you cheat on your income tax?*

Question B: *Are you less than 65 years old?*

If a sample of people less than 65 years old is used, then it would be known that the answer to Question B would always be "Yes."

This approach simplifies the estimating procedure and minimizes the variance of the estimate, other parameters being equal.

THE FORCED-ALTERNATIVE RANDOM RESPONSE (FARR) MODEL

The approach used in this study is an extension of Moors' suggestion which facilitates the use of this minimum variance model. The Forced-Alternative procedure, which is easily adaptable to a questionnaire survey or to group administration, eliminates the need for the second question by using the following procedure.

The subject, using some randomizing device, is instructed to (a) answer the question honestly or (b) automatically respond with "Yes." For example, given the question, "*I think whites are superior to blacks,*" the subject would follow a procedure that would randomly determine whether he is to answer honestly or automatically respond "Yes." (In terms of Moors' model, the subject is answering "Yes" to a non-existent second question.) This procedure makes a "Yes" response innocuous because a predefined percentage of the respondents are instructed to respond "Yes" automatically.

The Estimation Procedure

The proportion of those honestly responding "Yes" to the question is estimated by

$$\pi = \frac{\lambda - (1 - \rho')}{\rho'}$$

where π — the estimated proportion of those honestly answering "Yes"

λ — the proportion actually answering "Yes"

ρ' — the probability that the subject was required by the randomization procedure to answer the question honestly.

The variance of the estimate from Abul-Ela *et al.* is

$$\text{Var}(\pi) = \frac{\lambda (1 - \lambda)}{N \rho' 2}$$

where N is the sample size.

[1] J.A. Moors, "Optimization of the Unrelated Question Randomized Response Model," *Journal of the American Statistical Association*, vol. 66, no. 355, 1971, pp. 627-629.

The estimating procedure can best be illustrated with an example. Let us say that 100 people are asked: *"Do you need a drink to get going in the morning?"* Some randomizing procedure is used so that 30% of the subjects are directed to answer "Yes" and 70% are directed to answer honestly. After compiling the 100 answers, it is found that 60 people responded "No" and 40 people responded "Yes." By displaying this information in a 2 x 2 table we have the following:

		Was subject directed to answer honestly?		
		Honest Answer 70%	Automatic "Yes" 30%	(Actual answers)
What was the response to the question?	"Yes"			40 answered "Yes"
	"No"			60 answered "No"
Regardless of whether anyone needs a drink, we will have these response columns totals		70	30	100 total number subjects

Starting to complete the cells within this table, it is known that no one answers "No" unless he has done so honestly. Also, it is known that 30% of the sample were instructed to give an automatic "Yes" response. This completes 3 of the 4 cells as follows:

	Honest Answer	Automatic "Yes"	
"Yes" (I need a drink)		30	40 answered "Yes"
"No" (I don't need a drink)	60	0	60 answered "No"
	70	30	

We can easily compute the missing estimate in the top row by merely making the values in the table add up to the marginal totals:

	Honest Answer	Automatic "Yes"	
"Yes" (I need a drink)	10	30	40 answered "Yes"
"No" (I don't need a drink)	60	0	60 answered "No"
	70	30	100 subjects

Of the 70 who answered honestly, it is estimated that 10 answered "Yes." Thus, it is estimated that 10/70 or 14% of those in the group need a drink in the morning.

Note these key points:

(1) There is no way to identify the 14% since a total of 40 people answered "Yes" but only 10 were answering honestly.

(2) The 10 subjects who answered "Yes" really can feel safe since 3 out of 5 "Yes" responses are actually false responses.

(3) Accurate estimates of group incidence are easily obtainable with the method.

The principal advantages of the procedure over other random response procedures are that (a) it permits a series of questions to be easily and rapidly administered and (b) it minimizes the variance of the sample estimates.

BACKGROUND OF THE CURRENT STUDY

This study was one of several in Work Unit MODE which utilized random response (RR) or random inquiry (RI) techniques. A previous MODE study[1] compared (a) a mail-back version of the RI method and (b) a conventional mail-back questionnaire. Use was made of a factorial design which also permitted analyses yielding information on the effects of advance notice, rank (junior officer vs. enlisted men of grade O1-O4), and interactions between methods, advance versus no advance notice, and target groups (officers or enlisted men).

Findings and suggestions appearing in the Brown report represent the principal points of departure for the present study. First, Brown reports that the return rate for the survey of drug usage was substantially higher for officers than for enlisted men (51% vs. 27%). Second, return rates for the randomized inquiry technique used in the study were particularly low; they were only about one out of five for the enlisted men, as compared with about one out of two or three for the officers. Third, the study showed that "Advance Notice enhanced the return rate for officers (from 45 to 57%) but not for enlisted men (27 to 28%)."

In brief, then, it appeared that an RI method would be more likely to yield an acceptable return rate with junior officers than with enlisted men, and that officers should receive advance notice.

In addition, Brown states that the failure to find a significant advantage for the RI method over the conventional questionnaire method could have resulted from the particular variation of the RI method which he used in his mail-back study. The random inquiry approach he used presented respondents with a set of sensitive questions and a set of non-sensitive questions. The sensitive questions were on drug abuse and were the same for the RI and the conventional method. The non-sensitive questions covered such innocuous matters as education, age, and number of dependents. As with other RI methods, respondents were given a "randomization device" so that they could randomly select and answer one set of questions or the other without revealing which set they had answered. The "device" was simply to ask the respondent to choose one set of questions or the other on the basis of the month of his mother's birthday. To be specific, each respondent whose mother was born in November was directed to answer the innocuous questions; the other respondents were asked to answer the sensitive questions.

Brown notes that this "randomization device" may lack a critical feature, namely, "that the subject be able to see for himself that his selection of questions is determined by chance." He further states, "The chance determination of question selection probably must operate after the instrument (questionnaire) is in the subject's hands, and not before. . . It is hoped that future research may clarify this concept."

[1] G.H. Brown. *Randomized Inquiry vs. Conventional Questionnaire Method in Estimating Drug Usage Rates Through Mail Surveys*, HumRRO Technical Report 75-14, June 1975.

PURPOSE OF THE CURRENT STUDY

An RI or RR technique would often be of greater value if it could be successfully applied with a sizable number of questions rather than only a few.

In the present study, comparison was made between a newly devised random response technique and a conventional questionnaire. The new technique, FARR, can be easily applied to a large number of questions. Also, it was believed that respondents would see that it includes the feature Brown viewed as potentially critical—that the respondents would be able to see for themselves that chance determined whether or not they were asked to answer honestly any particular sensitive question. The sample included junior officers only, and all received advance notice. Thus, the comparison of the RR questionnaire was made under conditions which, except for questionnaire length, would be favorable to the RR approach.

This comparison represented the principal objective of the research. If the newly devised FARR technique yielded adequate rates of return and greater willingness to give the less socially acceptable responses when they are the honest answers, then the technique should be a valuable tool in obtaining from lower-ranking officers information about the state of social problems in the Army.

A second research question concerned a variation in the relative proportions of the time that the respondent would expect to be required to answer honestly. In the RR technique used, a "Yes" answer was always the "stigmatizing attribute," or, at least, the less socially or institutionally acceptable answer. If subjects were asked to answer honestly a very high proportion of the time, they may have been less likely to return the answer sheet completed according to the instructions. On the other hand, if the subjects were asked to answer honestly only about half of the time, the error variance of the estimate of honest "Yes" answers increases; however, subjects would be expected to have seen that their true beliefs were protected and thereby show a higher response rate and willingness to follow instructions.

Comparison was made between results obtained when honest answers were called for with a probability of (a) 83% and (b) 50%. Results of the comparison were expected to provide a basis for deciding whether it is better to ask for the higher rate of honest answers to obtain lower error variance with the risk that response rates (and actual proportion of honest answers) may be depressed; or whether it is preferable to ask for the lower rate of honest answers and accept the higher error variance of the estimates.

METHODOLOGY

The primary research question concerned the utility of the FARR procedure. Could the procedure be successfully employed in a mail-out survey requiring self-administration of a questionnaire having rather complex instructions and addressing a variety of socially sensitive topics?

The research question was tested on the basis of response rates, comments offered by respondents, and rates of incidence estimated from the FARR technique compared to conventional questionnaires.

An ancillary research question dealt with whether the subject's willingness to be honest was dependent on the degree of security offered by the procedure. Would a subject be more willing to admit something if he is required to answer honestly fewer times?

PROCEDURE

The sample consisted of 3000 company grade officers selected at random from active duty files. One thousand 2d lieutenants, 1st lieutenants, and captains were selected from duty stations within the continental United States.

The sample was further randomly divided into groups of 600, 900, and 1500. The smallest group received a conventional questionnaire, in which all the items were exactly the same as those on the FARR questionnaire. The second and third groups received the same questionnaire but with instructions to use the FARR procedure. The only difference between the instructions received by those two groups was the percentage of the items on which, by chance, the subject might be required to respond with the forced alternative rather than a true response.

One version was set up so that the subject had only a 50% chance of having to answer the sensitive questions honestly (FARR-50). In the other version there were five chances out of six that he would have to answer honestly (FARR-83). It was hypothesized that the less frequently the subject was required to answer honestly, the safer he would feel and the more honest he would be in responding.

Advance notice cards were mailed first class one week prior to mailing the questionnaires. The questionnaires were mailed third class bulk mailing.

THE QUESTIONNAIRE

The questionnaire (see Appendix B) consisted of three versions: the conventional questionnaire, the FARR-50, and the FARR-83. The conventional questionnaire provided a brief introduction of HumRRO[1] and an explanation of the research problem, and contained a set of instructions telling the subject to answer the questions honestly. The

[1] Note: All questionnaires included a statement explaining that two channels would be used, the U.S. Army Research Institute for the Behavioral and Social Sciences and HumRRO. This did not materialize. Only the HumRRO channel was used, but it was felt that this did not have any consequences upon return rate or data validity.

subject was also instructed not to sign his name (to insure anonymity), to answer all questions, and to return the questionnaire in the enclosed pre-addressed envelope.

The FARR-50 questionnaire presented the same information, as well as instructions on the use of the random number target in answering the questions. The FARR-50 questionnaire also included an address to which the recipient could write to receive a complete explanation of the RR method (see Appendix A).

The FARR-83 differed from the FARR-50 in that the probability of having to answer questions honestly was .83 rather than .50. Each version of the questionnaire emphasized that it was not necessary to put on any identifying marks.

The questionnaire included a total of 30 questions selected by various professionals in the HumRRO organization. There were 10 questions each on matters of drug use, racial awareness, and attitudes toward the Army. All questions could be answered either Yes or No. The information we were attempting to derive concerned the *methodology* of eliciting information—not the actual data on attitudes of military personnel.

A separate answer sheet was provided which included four demographic questions on level of education, age, race, and rank. Respondents were also asked if they had received an advance notice card (see Appendix C). Answer sheets were color-coded—indicating to the research team which survey method was used.

The questionnaire was mailed with the answer sheet, return envelope, and random number target if applicable. Returned answer sheets were sorted and recorded as they were returned. After the cutoff date of 15 May 1975, the answer sheets were key punched and the data processed.

Alternative Randomizing Devices

Randomizing devices which have been employed in the random inquiry surveys have included coin tosses, dice, spinners, and black and white marbles in a box. Another alternative is a random number target (RNT). Like the Forced-Alternative technique outlined here, it has the advantage of being easily used in group administrations of a questionnaire and is also an appropriate device for mail questionnaires.

Such a target is seen in Figure 1. It is used by instructing the subject to place a pencil point on the target without looking. Then, depending on the number(s) he might have landed on, the subject is instructed to either answer "Yes" or to answer honestly. (The procedure is described in more detail in the questionnaire instructions included in Appendix B.)

Advantages of the target are:

(1) It has been empirically tested to show that it will produce a random distribution. Randomness was tested by comparison of the results of a die rolled 1,000 times as compared to 1,000 selections from the RNT, and it was found that the RNT provided a more uniform distribution than did the die.

(2) Targets and instructions can be designed to manipulate the estimated percent of questions to be answered honestly, thus controlling the degree of confidence the subject can feel in responding to the question and the variance of the estimates.

(3) The target is easily included with mailout paper-and-pencil surveys.

(4) It is the least expensive randomizing device that can guarantee a uniform distribution.

Random Number Target

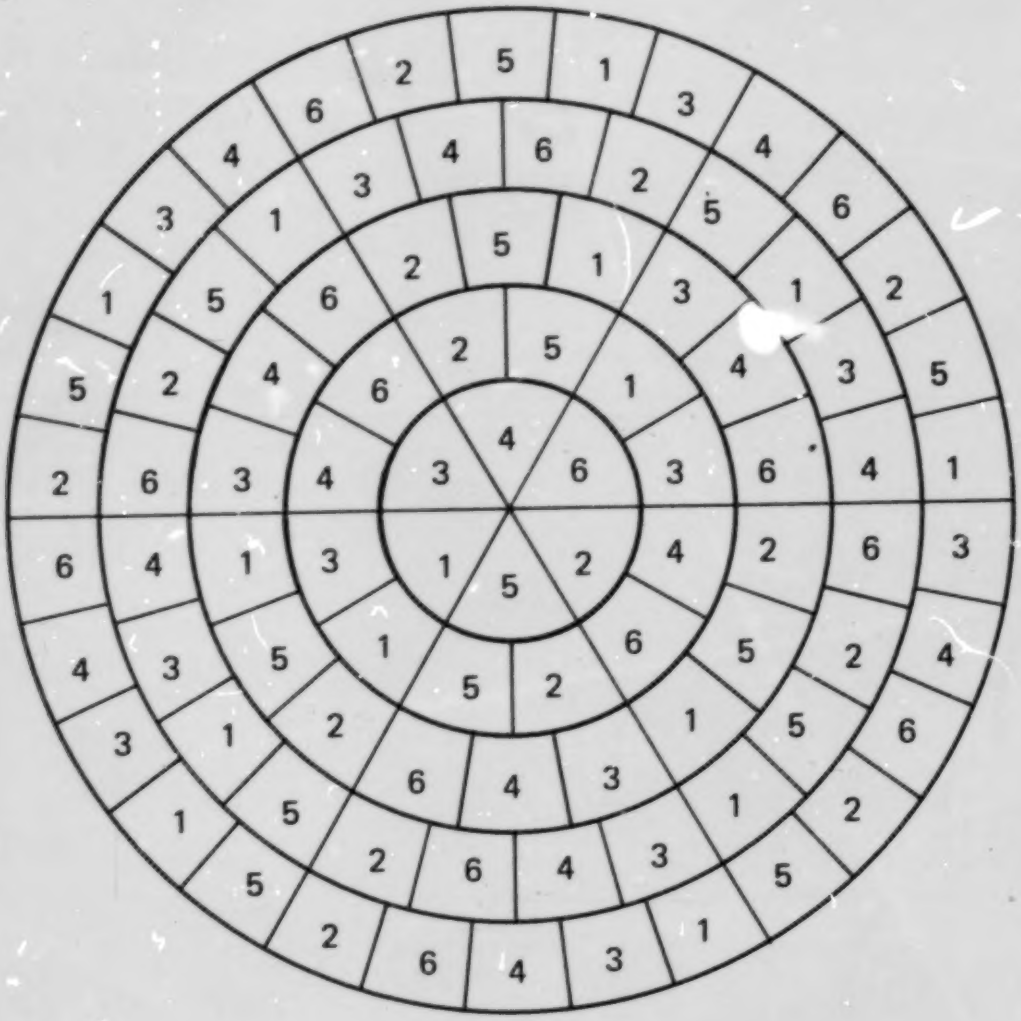

Figure 1. Random Number Target (RNT)

ADVANCE NOTICE CARDS

As reported by Brown,[1] "Advance notice enhanced the return rate [of questionnaires] for officers." The advance notice card (Appendix B) was a postcard sent first class one week prior to the mailing of the questionnaires. It contained a statement which informed the subject that he would be receiving a questionnaire within a few days and requested his cooperation. Furthermore, the subject was informed of the anonymity of the questionnaire and random nature of the selection of his name.

[1] Brown, *op. cit.*

RESULTS

The value of the FARR approach is determined on the basis of a series of questions:

(1) Were subjects able to use the FARR questionnaires?
(2) Is the subject's willingness to complete the questionnaire affected by the complexity of the instructions for the FARR approach?
(3) Does the FARR technique provide estimates of incidence higher than those of the conventional questionnaire?

The answer to the first question is yes, subjects were able to follow directions and complete the FARR questionnaire. The return rates for the conventional approach were 3 and 5 percentage points higher than those for the FARR questionnaires. One out of every 4 or 5 questionnaires was returned for all types.

The response to the second question is based on these same data. The rate of return for the conventional questionnaire was 26%. The FARR-83 and -50 versions had return rates of 22.8% and 20.9% respectively. The rate of return for all the questionnaire types was the same for practical purposes. Return statistics for each version of the questionnaire are presented in Table 1.

Table 1. **Rates of Response, by Questionnaire Type**

Questionnaire Type	Number Mailed	Number Returned	Rate *(Percent)*
Conventional Questionnaire	600	156	26.0
FARR-50	900	188	20.9
FARR-83	1500	342	22.8
FARR Total	2400	530	22.1
Total	3000	686	22.9

These rates of return are lower than those reported in prior research using similar circumstances.[1] The principal difference is the length of the questionnaire. Brown's instrument was a postcard questionnaire of five questions. It is presumed that the additional length accounts for the poorer rate of response received in this study.

It is pointed out that the FARR-50 yielded a lower return rate than did the FARR-83 version. It was expected that the reverse would be true since the FARR-50 offered greater protection. This result is discussed in connection with the incidence estimates derived from the three versions of the questionnaire.

The third question deals with the relative levels of the incidence estimates. If the FARR approach is viable, the estimates will be higher, supporting the assumption that respondents have been more honest when it was required by the technique.

The incidence estimates for each of the items in the questionnaire are presented in Table 2. For the reader's convenience, Figure 2 lists the items used on all versions of the

[1] Brown, *op. cit.*

Table 2. Estimates of Incidence, for Each Questionnaire Item

Item	Conventional	FARR-50	FARR-83
1	.038	-.148	.093
2	0	-.352	.016
3	0	-.224	.089
4	0	-.160	.078
5	0	-.352	.030
6	.179	.042	.271
7	.506	.394	.640
8	.244	.128	.317
9	.038	-.118	.076
10	0	-.178	.020
11	.173	.192	.310
12	.481	.522	.545
13	.077	-.192	.104
14	.013	-.276	.115
15	.032	.224	.047
16	.083	-.148	.155
17	.077	-.064	.229
18	.006	-.288	.040
19	.506	.566	.629
20	.038	-.118	.078
21	.712	.692	.717
22	.641	.574	.675
23	.385	.320	.502
24	.199	.064	.275
25	.442	.320	.457
26	.115	.320	.131
27	.295	.170	.377
28	.160	-.064	.212
29	.122	-.096	.149
30	.058	-.244	.047

questionnaire. As a test of whether subjects are more willing to honestly report positive responses using the FARR approach, the estimated levels of incidence from each version of the questionnaire were rank ordered. The differences between the estimates of each of the FARR versions and the conventional questionnaire were then compared using a Mann-Whitney U-Test[1] computed to test the hypothesis that the FARR versions estimated incidence higher than that of the conventional version.

[1] William L. Hays. *Statistics for Psychologists*, Holt, Rinehart and Winston, New York, 1963, pp. 633-635.

1. Have you used marijuana or hash within the last month?
2. Have you used LSD, mesc, or any other psychedelic within the last month?
3. Have you used any stimulants (e.g., speed, diet pills) without prescription within the last month?
4. Have you used any depressant (downer) without prescription within the last month?
5. Have you used any heroin (or other hard drug) within the last month?
6. Have you ever failed to report a soldier who you knew was using drugs illegally?
7. Do you think military efficiency of your unit is lowered as a result of marijuana or hash usage by the men?
8. Do you think men should be allowed to use marijuana freely while off duty?
9. Have you ever actually fouled up in your job due to excessive use of alcohol?
10. Have you ever fouled up in your job due to illegal use of drugs other than alcohol?
11. Do you prefer that your immediate superior be a member of your own race?
12. Are all of your close friends members of your own race?
13. Do you prefer that all of your immediate subordinates be members of your own race?
14. In deciding who should be promoted or recommended for promotion, do you favor men of your own race?
15. Would the Army be a better place to work if there were no mixing of races on the job?
16. Do you believe members of your race are generally superior to members of other races?
17. Do you find yourself avoiding interaction with members of other races than your own?
18. Have you ever assigned men to combat or other hardship tours on the basis of their race?
19. Do you sometimes find that you are prejudiced against another race?
20. Have you ever discriminated against a member of another race while carrying out your official duties?
21. Do you think the Army has become too permissive with respect to discipline of enlisted men?
22. Do you think that the all-volunteer Army concept will fail?
23. Do you think that the Army discourages a man from thinking for himself?
24. Do you think every soldier should have the right to disobey an order if he considers it unjust?
25. Do you think every soldier should have a right to speak out against the Army, even in public?
26. Do you feel that what you are doing in the Army is next to worthless as far as the country is concerned?
27. If you had a choice, would you serve your country in some way besides being a soldier?
28. If you were offered an honorable discharge today, would you take it?
29. Do you do your Army job only because you have to, not because you want to?
30. Is the reputation of the Army unimportant to you?

Figure 2. **List of Items Used on all Questionnaire Types**

The results are presented in Table 3. The FARR-83 version estimated prevalances higher than the conventional questionnaire. The critical ratio test was significant at the .065 level. FARR-50 estimates were lower than the estimates computed from the conventional questionnaire. A two-tailed test was computed to test whether the FARR-50 differed significantly from the conventional estimates. The test was significant at the .007 level.

Table 3. **Results of the Mann-Whitney U-Test of Significance**

Questionnaire Type	Difference Between Conventional Questionnaire and FARR Estimates		
	U	Z	Proportion From the Mean
FARR-50	284	-2.45	.993
FARR-83	552	1.51	.065

A secondary question asked: Will subjects answer more honestly if the probability of having to answer honestly is lower? To test the question of the effect of manipulation of these probabilities, the rates of estimated incidence between the FARR-50 and FARR-83 questionnaires were compared, again using the Mann-Whitney U-Test. The result is presented in Table 4.

Table 4. **Comparison of Estimates From the FARR-50 and FARR-83 Questionnaires**

U	Z	Proportion From the Mean
648	2.93	.001

The difference was significant at the .002 level but in the direction opposite to that anticipated. The version of the question providing the greatest security to the respondent resulted in estimates lower than those of the less safe FARR-83 version. (As noted before, the estimates from FARR-50 were also lower than those of the conventional questionnaires. The reasons for this can only be hypothesized. One explanation is offered in the Conclusions section.)

CONCLUSIONS

The basic question of the research project was: Is the Forced-Alternative Random Response technique a workable approach to gathering data on socially unacceptable attitudes or illicit behaviors? The overall conclusion is that the FARR procedure is an effective approach. Although not quite significant at the traditional .05 level of significance, the FARR-83 estimates were higher than those of the conventional questionnaire.

There remain some questions. The most apparent is why the FARR-50 estimates were significantly lower than those of either the conventional or FARR-83 questionnaire. A possible explanation is that the subjects were more willing to respond honestly given some protection than they were when forced to respond affirmatively about half the time.

The subjects may have resented having to indicate "yes" to so many items on which their true responses were negative. Then they would have tended to answer honestly regardless of the instructions, resulting in estimates lower than rationally possible. In this case, the estimates would not only be low, but negative. This would explain the fact that better than half of the FARR-50 estimates were negative.

This problem is not apparent in the FARR-83 data. Although the response rate was somewhat lower for the FARR-83 than the conventional, the estimates of incidence were higher than those for the conventional questionnaire.

The conclusions are:

(1) The FARR procedure is interesting and easy to use, making it a workable approach for the subjects used.

(2) The trade-off in return rates must be weighed against assumed greater honesty in responding. The decision to use the FARR approach depends on the sensitivity of the information being gathered, the sample size, and the subjects to be used.

(3) The level of protection offered by the proportion of questions requiring an honest response affects the respondents' willingness to give honest affirmative answers. This effect was the opposite of what was expected. When given a high level of protection, the subject must indicate affirmative answers too often. Presumably there is some level of probability of having to respond honestly which will provide the subject with sufficient confidence, but does not require him to give so many affirmative responses that the procedure is rejected.

The value of the FARR procedure and other random response/inquiry techniques must always be decided by the researcher conducting a particular survey. Although many individuals are willing to answer sensitive questions, there are always some topics and situations in which a guarantee of anonymity on a given response may provide more valid data. The trade-off is in terms of time for administration of the more complex random procedures. The one condition may be that subjects are capable of understanding and following instructions. It is relevant that the subjects for this study are relatively well educated. The extent to which the technique can be applied to less educated or less literate groups was not addressed here.

The FARR approach appears to be a procedure applicable not only to one-to-one interview situations (like other random response techniques) but one also appropriate for mass administration. The versions tested here used a procedure for dichotomous items. The FARR procedure can easily be modified for use with multiple choice items. The random number target devised as part of the FARR procedure can be designed to control probabilities of response for any number of possible responses to a multiple choice item, thus making the entire procedure of possible value and interest in a broad range of settings and applicable to a variety of questionnaire instruments.

BIBLIOGRAPHY

Abul-Ela, A.A., Greenberg, B.G., and Horvitz, D.G., "A Multi-proportions Randomized Response Model," *Journal of the American Statistical Association*, September 1967, pp. 990-1008.

Brown, G.H. and Harding, F.D. *A Comparison of Methods of Studying Illicit Drug Usage*, HumRRO Technical Report 73-9, April 1973.

Brown, G.H. *Randomized Inquiry vs. Conventional Questionnaire Method in Estimating Drug Usage Rates Through Mail Surveys*, HumRRO Technical Report 75-14, June 1975.

Greenberg, B.G., Abul-Ela, A.A., Simmons, W.R., and Horvitz, D.G. "The Unrelated Question Randomized Response Model: Theoretical Framework," *Journal of American Statistical Association*, vol. 64, 1969, pp. 520-539.

Hays, William L. *Statistics for Psychologists*, Holt, Rinehart and Winston, New York, 1963, pp. 633-635.

Horvitz, D.G., Shak, B.V. and Simmons, W.R. "The Unrelated Question Randomized Response Model, *Proceedings of the Social Statistics Section of the American Statistical Association*, 1967, pp. 65-70.

Moors, J.A. "Optimization of the Unrelated Question Randomized Response Model," *Journal of the American Statistical Association*, vol. 66, no. 355, 1971, pp. 627-629.

Simmons, W.R. "Response to Randomized Inquiries: A Technique for Reducing Bias," *Administrative Applications Division Conference Transactions, American Society for Quality Control*, March 1970, vol. 1, no. 10, pp. 4-13.

Warner, S.L. "Randomized Responses: A Survey Technique for Eliminating Evasive Answer Bias," *Journal of the American Statistical Association*, vol. 60, 1965, pp. 63-69.

Appendix A

BACKGROUND PAPER, "A FORCED-ALTERNATIVE RANDOM INQUIRY PROCEDURE FOR GROUP OR SELF ADMINISTRATION"

This paper, prepared by Joel M. Reaser in May 1973, was subsequently used during the research study described in this report, to provide background information to respondents who requested it.

THE PROBLEM

Gaining cooperation of subjects when soliciting information regarding knowledge of, or experience with, socially sensitive attitudes or behaviors is a crucial problem in research on social issues. Individuals are reluctant to provide their true feelings concerning many socially sensitive issues, particularly if their attitudes or experiences might be illegal or if there is any threat of their being identified. Regardless of guarantees *of* confidentiality or anonymity, subjects remain threatened when responding to such questions. Yet, it is essential that measures of incidence and prevalence of sensitive and/or illicit activities and related attitudes be gathered.

THE RANDOM INQUIRY TECHNIQUE

Warner[1] devised an ingenious procedure for overcoming this problem. The Random Response (or Random Inquiry—*RI*) technique is a uniquely appropriate procedure for eliciting cooperation from subjects asked to respond to questions on sensitive issues such as drug use, race, abortion, dissatisfaction with one's superiors or organization.

The Randomized Inquiry method for collecting sensitive information provides the subject and the researcher with a guaranteed anonymity. This method has proven of great value in collecting data on abortions, drug use, and other socially sensitive topics.

Warner's original strategy was to provide the subject a chance to answer either one of two questions, for example:

Question A: I use heroin.

Question B: I do not use heroin.

The subject, using some randomizing device (e.g. dice toss, coin flip), draws one of the two questions and simply answers "True" or "False" without telling the experimenter which question he is responding to. By knowing the probabilities associated with drawing either question, the number of those who actually use heroin can be accurately estimated, yet the identity of the individuals who indicated they use heroin remains unknown.

[1] Warner, *op. cit.*

The appeal of this approach has attracted a number of researchers interested in applying or refining the technique. Extensions have been made by Abul-Ela, Greenberg, and Horvitz,[1] and Horvitz, Shak, and Simmons.[2] These efforts have been made to find maximally efficient alternatives to the original Warner technique.

Horvitz, Shak, and Simmons used a variation wherein Question B was totally innocuous and unrelated to Question A which was a sensitive question. For example:

Question A: Did you induce an abortion last year?

Question B: Were you born in North Carolina?

These authors point out two advantages to the use of an innocuous second question to which a known number of people will respond "Yes":

1. The subject sees that there is a good likelihood of his answer being related to an entirely non-threatening question.

2. The variance of the estimate of the percent of those with the stigmatizing characteristic is smaller than in the Warner technique.

Moors[3] points out that the variance can be further reduced if the second question is such that the answer is always known. A trivial example is:

Question A: Did you cheat on your income tax?

Question B: Are you less than 65 years old?

If a sample of less-than-65-year-olds is used, then it would be known that the answer to *B* would always be "Yes."

This approach simplifies the estimating procedure and minimizes the variance around the estimate, other parameters being equal.

THE FORCED ALTERNATIVE MODEL

The approach proposed is an extension of Moors' suggestion which facilitates the use of this minimum variance model. This Forced Alternative procedure is easily adaptable to a questionnaire survey or to group administration and eliminates the need for the second question by using the following procedure: The subject, using some randomizing device, is instructed to (a) answer the question honestly or (b) simply respond with "Yes." For example, given the question,

"I think whites are superior to blacks."

the subject would randomly select whether he is to answer honestly or simply answer "Yes." (In terms of Moors' model, the subject is answering "Yes" to a non-existent second question.) This procedure makes a "Yes" response innocuous a predefined percentage of the time—the subject is instructed to answer "Yes" whether or not he really holds a view or has participated in something which is socially unacceptable or illegal. Sample questions of each RI Model are seen in Figure A-1.

Derivation

The proportion of those honestly responding "Yes" to the question is estimated by

$$\pi = \frac{\lambda - (1 - \rho')}{\rho'}$$

[1] Abul-Ela, Greenberg, and Horvitz, *op. cit.*

[2] Horvitz, Shak, and Simmons, *op. cit.*

[3] Moors, *op. cit.*

1.	Warner's Model		
	I am a member of group A.	T	F
	I am not a member of group A.		
2.	Multiple proportions randomized response model		
	I belong to group A.		
	I belong to group A′.	T	F
	I do not belong to groups A or A′.		
3.	Unrelated question		
	I belong to group A.	T	F
	I belong to group B.		
4.	Forced Alternative		
	I belong to group A.	T	F

Figure A-1. **Sample Questions Illustrating Differences in Random Inquiry/Random Response Models.**

where π — the estimated proportion of those honestly answering "yes"

λ — the proportion actually answering "yes"

ρ' — the probability that the subject was required by the randomization procedure to answer the question honestly.

The variance of the estimate from Abul-Ela, Greenberg, and Horvitz[1] is

$$\text{Var } (\pi) = \frac{\lambda\ (1 - \lambda)}{N\rho'2}$$

where N is the sample size.

The estimating procedure can best be understood with an example. Let us say that 100 people are asked: "Do you need a drink to get going in the morning?" Some randomizing procedure is used so that 30% of the subjects are directed to answer "Yes" and 70% are directed to answer honestly. After compiling the 100 answers, it is found that 60 people responded "No" and 40 people responded "Yes." By displaying this information in a 2 X 2 table we have the following:

		Was subject directed to answer honestly?		
		Yes 70%	No 30%	
What was response to the question?	"Yes"			40 total answering "Yes"
If "No" needs a drink we would expect these responses	"No"			60 total answering "N"
		70	30	100 total number subjects

[1] Abul-Ela, Greenberg, and Horvitz, *op. cit.*

Starting with this table, we also know that no one answers "No" unless he has done so honestly. Therefore, the table becomes

	Y	N	
Y			40
N	60	0	60
	70	30	100

Given these entries we can now compute the estimates for the top row by merely making the values in the table sum up to the totals for each row and column.

	Y	N	
Y	10	30	40
N	60	0	60
	70	30	100

Now, of those who answered honestly, 70, we have estimated that 10 answered "Yes." Thus, it is estimated that 10/70 or 14% of those in the group need a drink in the morning.

Note these key points:

1. *There is no way to identify the 14% since a total of 40 people answered "Yes" but only 10 were answering honestly.*

2. *The 10 subjects who answered "Yes" honestly can feel safe since 3 out of 5 "Yes" responses are actually false responses.*

3. *Accurate estimates of group incidence are easily obtainable with the method.*

Limitations of the Forced-Alternative Model

This variation has two inherent limitations. First, all the questions must be worded in such a way as to make only one of the responses a stigmatizing response for an entire set of questions. If any of the other techniques are used, either "Yes" or "No" could be stigmatizing for any given question within a series of questions. For example, the unrelated question technique could present this sequence:

1.	A	Did you cheat on your income tax?		
	B	Were you born in April?	Yes	No
2.	A	Do you believe in God?		
	B	Are you right-handed?	Yes	No

In these example questions "Yes" is the threatening response to the stigmatizing question; "No" is the threatening response to the second.

Using the Forced-Alternative technique, the questions could not be stated as above. The second question must be phrased so that the stigmatizing response is "Yes." That is, the question would have to read: Do you *not* believe in God? If the question were stated as in the example, then the person who was instructed to answer honestly and answered

"No" would be admitting to the stigmatizing attribute. To reiterate, for the Forced-Alternative technique, all questions in a survey must have only one response, as the stigmatized response.

A second limitation is that only one of the two responses can have any stigmatizing value. The Forced-Alternative technique cannot handle the case where either the "Yes" or "No" response could be threatening to respondents. For example consider the question—

Are you opposed to any interracial marriage?

Since there are substantial numbers of people to whom "Yes" would be an indication of being prejudiced and others to whom "No" is an indicator of social radicalism, neither response would be admitted freely by all respondents. Again, one of the other random inquiry variations would be more appropriate.

Advantage of the Forced-Alternative Random Inquiry Technique

The principal advantage of the procedure over other random inquiry procedures is that (a) it permits a series of questions to be easily and rapidly administered and (b) it is one of the procedures minimizing the variance of the sample estimates.

Alternative Randomizing Devices

Randomizing devices which have been employed in the random inquiry surveys have included coin tosses, dice, spinners, and black and white marbles in a box. Another alternative is a random number target. Like the Forced-Alternative technique outlined in this paper, it has the advantage of being most easily used in group administrations of a questionnaire and is also the most appropriate device for mailout questionnaires.

Such a target is seen in Figure 1 [see Figure 1 in the report text]. It is used simply by instructing the subject to place a pencil point on the target without looking. The subject is then instructed to either answer "Yes" or to answer honestly depending on the number(s) he might have landed on.

The advantages to the target are as follows:

1. It has been empirically tested to show that it will produce a random distribution.
2. Targets can be designed to designate any percent of questions to be answered honestly thus controlling the degree of confidence the subject can feel in responding to the questions.
3. The target is easily included with mailout paper and pencil surveys.
4. It is the least expensive such randomizing device which can guarantee a uniform distribution.

Summary

This paper presents a variation of the Random Inquiry technique, the Forced-Alternative Random Inquiry technique. This technique, making use of the random number target, has presented a unique strategy for making use of the benefits of Random Inquiry technique in mass administrations and mailouts of surveys on sensitive attitudes and activities.

Appendix B

SURVEY MATERIALS

SOCIAL PROBLEMS QUESTIONNAIRE *(Conventional)*

To what extent can you believe the results of surveys which concern drug abuse, race relations, or other social problem areas? Many people may be uneasy about giving totally candid answers to some of the questions on these surveys. The Human Resources Research Organization (HumRRO), a civilian research organization, and the Army Research Institute (ARI) are cooperating in a survey that will be completely anonymous.

One important purpose of the research is to compare different methods of collecting information. Therefore, the questionnaire you received may not be the same as the one received by *one of your fellow officers.* Also, some men are asked to return their answer sheet to HumRRO and some to ARI.

Your name was selected by chance to receive this questionnaire, and you don't sign your name to any part of it. You can complete it in a very few minutes. Please answer each of the thirty questions by checking Yes or No on the separate answer sheet—remember, do not sign your name anywhere. Return the completed answer sheet in the enclosed, pre-addressed envelope. Just drop the letter in the mail, no stamp is required.

Please do it now. Thanks.

Please Return By
15 May 1974

1. Have you used marijuana or hash within the last month?
2. Have you used LSD, mesc, or any other psychedelic within the last month?
3. Have you used any stimulants (e.g., speed, diet pills) without prescription within the last month?
4. Have you used any depressant (downer) without prescription within the last month?
5. Have you used any heroin (or other hard drug) within the last month?
6. Have you ever failed to report a soldier who you knew was using drugs illegally?
7. Do you think military efficiency of your unit is lowered as a result of marijuana or hash usage by the men?
8. Do you think men should be allowed to use marijuana freely while off duty?
9. Have you ever actually fouled up in your job due to excessive use of alcohol?
10. Have you ever fouled up in your job due to illegal use of drugs other than alcohol?
11. Do you prefer that your immediate superior be a member of your own race?
12. Are all of your close friends members of your own race?
13. Do you prefer that all of your immediate subordinates be members of your own race?
14. In deciding who should be promoted or recommended for promotion, do you favor men of your own race?
15. Would the Army be a better place to work if there were no mixing of races on the job?
16. Do you believe members of your race are generally superior to members of other races?
17. Do you find yourself avoiding interaction with members of other races than your own?
18. Have you ever assigned men to combat or other hardship tours on the basis of their race?
19. Do you sometimes find that you are prejudiced against another race?
20. Have you ever discriminated against a member of another race while carrying out your official duties?
21. Do you think the Army has become too permissive with respect to discipline of enlisted men?
22. Do you think that the all-volunteer Army concept will fail?
23. Do you think that the Army discourages a man from thinking for himself?
24. Do you think every soldier should have the right to disobey an order if he considers it unjust?
25. Do you think every soldier should have a right to speak out against the Army, even in public?
26. Do you feel that what you are doing in the Army is next to worthless as far as the country is concerned?
27. If you had a choice, would you serve your country in some way besides being a soldier?
28. If you were offered an honorable discharge today, would you take it?
29. Do you do your Army job only because you have to, not because you want to?
30. Is the reputation of the Army unimportant to you?

SOCIAL PROBLEMS QUESTIONNAIRE *(FARR-83)*

To what extent can you believe the results of surveys which concern drug abuse, race relations, or other social problem areas? Many people may be uneasy about giving totally candid answers to some of the questions on these surveys. The Human Resources Research Organization (HumRRO), a civilian research organization, and the Army Research Institute (ARI) are cooperating in a survey that will be completely anonymous.

One important purpose of the research is to compare different methods of collecting information. Therefore, the questionnaire you received may not be the same as the one received by one of your fellow officers. Also, some men are asked to return their answer sheet to HumRRO and some to ARI.

The questionnaire you received uses a new survey method to get information that cannot be traced to the person who provided it. With this method it is impossible for you to get into trouble by being truthful. You may not understand how the method works, but you can see that it is safe.*

Below are thirty questions. You are to answer some of them honestly by checking Yes or No on the separate answer sheet. You are to disregard other questions, simply checking Yes on the answer sheet.

How do you tell which questions you answer honestly and which questions call for an automatic check of Yes? Here's what you do:

Notice that in the materials sent to you there is a separate page labeled RANDOM NUMBER TARGET. Before answering question 1, close your eyes, and move your pencil around above the Number Target. Then, keeping your eyes closed, bring your pencil down onto the target. If the tip of your pencil comes down onto an area of the target containing the numbers 1 through 5, answer the question—and answer it honestly. If your pencil point comes down onto an area with a 6, disregard the question and simply check Yes on your answer sheet.

If your pencil comes down on a line between numbered areas, try again.

After making your check for question 1, go on to question 2. Again, take the Number Target, close your eyes, and use your pencil as a pointer. Answer question 2 honestly if your pencil point lands on an area labeled 1, 2, 3, 4, or 5. If it lands on a 6, disregard the question and just check Yes on your answer sheet.

Try not to hit the same area of the target each time.

Remember: If you land on an area numbered 1 through 5—answer honestly.
If you land on an area numbered 6—just check Yes.
If you land on a border line—use the Number Target again.

Proceed in this way through each one of the questions—it will take only a few minutes. Do not sign your name anywhere. No one but you will know whether a particular Yes check is an honest answer to that question. Return the completed answer sheet (and only the answer sheet) in the enclosed, pre-addressed envelope. Just drop the letter in the mail, no stamp is required.

Please do it now. Thanks.

*NOTE: If you would like a complete explanation of this research method, write to HumRRO, 300 N. Washington Street, Alexandria, Virginia 22314, ATTN: Dr. Hoehn. An explanation will be sent to you.

35 **Please Return By 15 May 1974**

1. Have you used marijuana or hash within the last month?
2. Have you used LSD, mesc, or any other psychedelic within the last month?
3. Have you used any stimulants (e.g., speed, diet pills) without prescription within the last month?
4. Have you used any depressant (downer) without prescription within the last month?
5. Have you used any heroin (or other hard drug) within the last month?
6. Have you ever failed to report a soldier who you knew was using drugs illegally?
7. Do you think military efficiency of your unit is lowered as a result of marijuana or hash usage by the men?
8. Do you think men should be allowed to use marijuana freely while off duty?
9. Have you ever actually fouled up in your job due to excessive use of alcohol?
10. Have you ever fouled up in your job due to illegal use of drugs other than alcohol?
11. Do you prefer that your immediate superior be a member of your own race?
12. Are all of your close friends members of your own race?
13. Do you prefer that all of your immediate subordinates be members of your own race?
14. In deciding who should be promoted or recommended for promotion, do you favor men of your own race?
15. Would the Army be a better place to work if there were no mixing of races on the job?
16. Do you believe members of your race are generally superior to members of other races?
17. Do you find yourself avoiding interaction with members of other races than your own?
18. Have you ever assigned men to combat or other hardship tours on the basis of their race?
19. Do you sometimes find that you are prejudiced against another race?
20. Have you ever discriminated against a member of another race while carrying out your official duties?
21. Do you think the Army has become too permissive with respect to discipline of enlisted men?
22. Do you think that the all-volunteer Army concept will fail?
23. Do you think that the Army discourages a man from thinking for himself?
24. Do you think every soldier should have the right to disobey an order if he considers it unjust?
25. Do you think every soldier should have a right to speak out against the Army, even in public?
26. Do you feel that what you are doing in the Army is next to worthless as far as the country is concerned?
27. If you had a choice, would you serve your country in some way besides being a soldier?
28. If you were offered an honorable discharge today, would you take it?
29. Do you do your Army job only because you have to, not because you want to?
30. Is the reputation of the Army unimportant to you?

SOCIAL PROBLEMS QUESTIONNAIRE *(FARR-50)*

To what extent can you believe the results of surveys which concern drug abuse, race relations, or other social problem areas? Many people may be uneasy about giving totally candid answers to some of the questions on these surveys. The Human Resources Research Organization (HumRRO), a civilian research organization, and the Army Research Institute (ARI) are cooperating in a survey that will be completely anonymous.

One important purpose of the research is to compare different methods of collecting information. Therefore, the questionnaire you received may not be the same as the one received by one of your fellow officers. Also, some men are asked to return their answer sheet to HumRRO and some to ARI.

The questionnaire you received uses a new survey method to get information that cannot be traced to the person who provided it. With this method it is impossible for you to get into trouble by being truthful. You may not understand how the method works, but you can see that it is safe.*

Below are thirty questions. You are to answer some of them honestly by checking Yes or No on the separate answer sheet. You are to disregard other questions, simply checking Yes on the answer sheet.

How do you tell which questions you answer honestly and which questions call for an automatic check of Yes? Here's what you do:

Notice that in the materials sent to you there is a separate page labeled RANDOM NUMBER TARGET. Before answering question 1, close your eyes, and move your pencil around above the Number Target. Then, keeping your eyes closed, bring your pencil down onto the target. If the tip of your pencil comes down onto an area of the target containing an even number (2, 4 or 6), answer the question—and answer it honestly. If your pencil comes down onto an area with an odd number (1, 3 or 5), disregard the question and automatically check Yes on your answer sheet.

If your pencil comes down on a line between numbered areas, try again.

After making your check for question, go on to question 2. Again, take the Number Target, close your eyes, and use your pencil as a pointer. Answer question 2 honestly if your pencil point lands on an area with an even number (2, 4 or 6). If it lands on an odd number (1, 3 or 5), disregard the question and just check Yes on your answer sheet.

Try not to hit the same area of the target each time.

Remember: If you land on a 2, 4 or 6—answer honestly.
If you land on a 1, 3 or 5—just check Yes.
If you land on a border line—use the Number Target again.

Proceed in this way through each one of the questions—it will take only a few minutes. Do not sign your name anywhere. No one but you will know whether a particular Yes check is an honest answer to that question. Return the completed answer sheet (and only the answer sheet) in the enclosed, pre-addressed envelope. Just drop the letter in the mail, no stamp is required.

Please do it now. Thanks.

*NOTE: If you would like a complete explanation of this research method, write to HumRRO, 300 N. Washington Street, Alexandria, Virginia 22314, ATTN: Dr. Hoehn. An explanation will be sent to you.

Please Return By
15 May 1974

1. Have you used marijuana or hash within the last month?
2. Have you used LSD, mesc, or any other psychedelic within the last month?
3. Have you used any stimulants (e.g., speed, diet pills) without prescription within the last month?
4. Have you used any depressant (downer) without prescription within the last month?
5. Have you used any heroin (or other hard drug) within the last month?
6. Have you ever failed to report a soldier who you knew was using drugs illegally?
7. Do you think military efficiency of your unit is lowered as a result of marijuana or hash usage by the men?
8. Do you think men should be allowed to use marijuana freely while off duty?
9. Have you ever actually fouled up in your job due to excessive use of alcohol?
10. Have you ever fouled up in your job due to illegal use of drugs other than alcohol?
11. Do you prefer that your immediate superior be a member of your own race?
12. Are all of your close friends members of your own race?
13. Do you prefer that all of your immediate subordinates be members of your own race?
14. In deciding who should be promoted or recommended for promotion, do you favor men of your own race?
15. Would the Army be a better place to work if there were no mixing of races on the job?
16. Do you believe members of your race are generally superior to members of other races?
17. Do you find yourself avoiding interaction with members of other races than your own?
18. Have you ever assigned men to combat or other hardship tours on the basis of their race?
19. Do you sometimes find that you are prejudiced against another race?
20. Have you ever discriminated against a member of another race while carrying out your official duties?
21. Do you think the Army has become too permissive with respect to discipline of enlisted men?
22. Do you think that the all-volunteer Army concept will fail?
23. Do you think that the Army discourages a man from thinking for himself?
24. Do you think every soldier should have the right to disobey an order if he considers it unjust?
25. Do you think every soldier should have a right to speak out against the Army, even in public?
26. Do you feel that what you are doing in the Army is next to worthless as far as the country is concerned?
27. If you had a choice, would you serve your country in some way besides being a soldier?
28. If you were offered an honorable discharge today, would you take it?
29. Do you do your Army job only because you have to, not because you want to?
30. Is the reputation of the Army unimportant to you?

HumRRO

ANSWER SHEET[1]

1. Yes ____ No ____	11. Yes ____ No ____	21. Yes ____ No ____
2. Yes ____ No ____	12. Yes ____ No ____	22. Yes ____ No ____
3. Yes ____ No ____	13. Yes ____ No ____	23. Yes ____ No ____
4. Yes ____ No ____	14. Yes ____ No ____	24. Yes ____ No ____
5. Yes ____ No ____	15. Yes ____ No ____	25. Yes ____ No ____
6. Yes ____ No ____	16. Yes ____ No ____	26. Yes ____ No ____
7. Yes ____ No ____	17. Yes ____ No ____	27. Yes ____ No ____
8. Yes ____ No ____	18. Yes ____ No ____	28. Yes ____ No ____
9. Yes ____ No ____	19. Yes ____ No ____	29. Yes ____ No ____
10. Yes ____ No ____	20. Yes ____ No ____	30. Yes ____ No ____

A. What was your highest level of education when you entered the Army?

____ 1. Did not graduate from high school
____ 2. Graduated from high school
____ 3. Attended college but had not completed four years
____ 4. Graduated from regular four-year college
____ 5. Did graduate study at college or university

B. How old were you on your last birthday?

____ 1. Less than 20 years old
____ 2. 21 or 22 years old
____ 3. 23 or 24 years old
____ 4. 25 or 26 years old
____ 5. Over 26 years old

C. What is your race?

____ 1. White
____ 2. Black
____ 3. Other

D. What is your rank or grade?

____ 1. Enlisted
____ 2. Second Lieutenant
____ 3. First Lieutenant
____ 4. Captain
____ 5. Major
____ 6. Above Major

Check here if you received advance notice of this questionnaire ____

*NOTE: The color of this answer sheet indicates which survey method was used in the questionnaire you received.

[1] Answer Sheets for the three survey methods were identical except for the color of the paper.

ADVANCE NOTICE CARD

In a few days you will receive a short questionnaire in the mail. Your name was chosen at random, by computer, from the names of Army officers in CONUS.

You will be asked to check a Yes or No for each question. The Yes or No checks will be on a separate anonymous page. You will not be asked to sign your name anywhere.

The purpose of this note is to ask you in advance for your cooperation in filling out the questionnaire. It will take only a few minutes of your time, and you will be assisting in a research project dealing with some important areas.

Thank you very much.

Sincerely,

Dr. Arthur J. Hoehn
Human Resources Research Organization

Appendix C

DEMOGRAPHICS OF THE SAMPLE

Of the 684 individuals responding to the item concerning education, over 50 percent in each category indicated that they were college graduates. Over 20 percent in all categories have done graduate study and an average of 20.5 percent of the respondents were less than college graduates.

Table C-1. **Return Sample Distribution, by Educational Level**

Questionnaire Type	Not H.S. Graduate	H.S. Graduate	College	College Graduate	Graduate Study	Total N
Conventional						
N	2	9	19	89	36	155
%	1.3	5.8	12.2	57.1	23.1	
FARR-50						
N	2	15	18	97	55	187
%	1.1	8.0	9.6	51.6	29.3	
FARR-83						
N	5	26	50	177	84	342
%	1.5	7.6	14.5	51.5	24.4	

For all categories (conventional, FARR-50, FARR-83) an average of 66.4 percent of the respondents were over 26 years old, 18.3 percent were 25 or 26 years old, and 15.3 percent of all remaining subjects were 24 years old or younger.

Table C-2. **Return Sample Distribution, by Age at Last Birthday**

Questionnaire Type	20	21/22	23/24	25/26	Over 26	Total N
Conventional						
N			25	25	105	155
%			16.0	16.0	67.3	
FARR-50						
N		2	27	41	117	187
%		1.1	14.4	21.8	62.2	
FARR-83						
N	1	5	37	59	240	342
%	0.3	1.5	10,8	17.2	69.8	

Over 90 percent of the 683 respondents were white, less than 5 percent were black, and the "other" category comprised less than 3 percent of the sample population.

Table C-3. **Return Sample Distribution, by Racial Group**

Questionnaire Type	White	Black	Others	Total N
Conventional				
N	144	7	4	155
%	92.3	4.5	2.6	
FARR-50				
N	175	7	4	186
%	93.1	3.7	2.1	
FARR-83				
N	316	17	9	342
%	91.9	4.9	2.6	

Captains constituted 65.6 percent of the sample (N=683), 15.6 percent were 1st Lieutenants, 17.4 percent were 2d Lieutenants, and less than 1 percent were Majors. No enlisted men were included in the sample.

Table C-4. **Return Sample Distribution, by Pay Grade**

Questionnaire Type	2nd LT	1st LT	CPT	Major	Total N
Conventional					
N	30	21	102	1	154
%	19.2	13.5	65.4	.6	
FARR-50					
N	34	34	118	1	187
%	18.1	18.1	62.8	.5	
FARR-83					
N	49	52	236	5	342
%	14.2	15.1	68.6	1.5	

Of the 688 individuals who returned an answer sheet, 72.1 percent responded affirmatively to the item requesting acknowledgment of receipt of an advance notice card. The item was not answered by 27.9 percent of those returning the answer sheet.

Table C-5. **Breakdown of Those Who Received Advance Notice Cards**

Questionnaire Type	Yes	No Response
Conventional		
N	107	49
%	68.6	31.4
FARR-50		
N	137	51
%	72.9	27.1
FARR-83		
N	257	87
%	74.7	25.3
Total N	501	187

HUMAN RESOURCES RESEARCH ORGANIZATION

300 North Washington Street • Alexandria, Virginia 22314

President	Dr. Meredith P. Crawford
Executive Vice President	Dr. William A. McClelland
Executive Officer	Mr. Saul Lavisky
Vice President & Treasurer	Mr. Charles W. Smith
Director for Program Development	Mr. David S. Bushnell
Director Editorial & Production Center	Mrs. Lola M. Zook

RESEARCH DIVISIONS

HumRRO Eastern Division 300 North Washington Street Alexandria, Virginia 22314	Dr. J. Daniel Lyons Vice President & Director
HumRRO Central Division Suite 6, 313 N. Foster Street Dothan, Alabama 36301	Dr. Wallace W. Prophet Vice President & Director
Louisville Research Office 1939 Goldsmith Lane Louisville, Kentucky 40218	Mr. William C. Osborn Office Director
Columbus Research Office Suite 23, 2601 Cross Country Road Columbus, Georgia 31906	Dr. Joseph A. Olmstead Office Director
Dothan Research Office P.O. Box 428 Fort Rucker, Alabama 36360	Dr. Paul W. Caro Office Director
HumRRO Western Division 27857 Berwick Drive Carmel, California 93921	Dr. Howard H. McFann Vice President & Director
El Paso Research Office P.O. Box 6057 Fort Bliss, Texas 79916	Dr. Robert D. Baldwin Office Director